AMENDED CLAIMS

1. (Currently Amended) A method of treating a liquid stream which contains impurities in limited amounts with a solid adsorbent having an affinity for the impurities compared with other components in the liquid to reduce the impurities for the adsorber-treated product with the following steps:

providing a liquid fresh feedstream to an adsorber, the liquid fresh feedstream being effectively cooled and effectively free from agents which might degrade the impurity removal performance after long term regeneration;

providing a porous, particulate adsorbent within an 8 to 45 ~~48~~ Tyler mesh range and in a narrow fraction such that excessive size segregation or top to bottom mixing does not occur ~~is effective~~ when subject to fluidization with bed expansions no greater than 10 percent with the liquid feedstream or liquid effluent from preceding adsorption stages;

providing an adsorption section consisting of liquid fluidized stages with a bottom inlet and an upper outlet in at least one adsorber vessel;

introducing an adsorbent stream as a cooled slurry into the ~~an~~ upper part of a last adsorption stage to countercurrent contact the said liquid stream that flows upward from a preceding adsorption stage until the said adsorbent leaves as spent adsorbent and the said liquid fresh feedstream enters the ~~a~~ fresh feed entry adsorption stage;

withdrawing spent adsorbent continuously as a slurry near an inlet distributor of the fresh feed adsorption stage to proceed to a liquid-solid separator that separates liquid forming the slurry for return as liquid to the fresh feed entry adsorption ~~feed~~ stage, whereas the solids separated enter a regeneration section that has at least two desorption zones and a cool-down zone for the regeneration of the spent adsorbent stream;

providing the regeneration section with two or more desorption zones which first continuously desorb a portion of the desired liquid product initially in spent adsorbent pores ~~of the adsorbent~~ at successively higher temperatures in the respective desorption zones, by recirculating gas after cooling and condensing most of the liquid released in the respective desorption zones, with impurity concentration of condensed liquid from the first desorption zone ~~at least one of the desorption zones~~ being significantly lower than that of the fresh feed, inlet gas

is heated ~~desorption~~ in the respective desorption zones to accomplish desorption; ~~being accomplished by stripping and heating with this recirculated gas with makeup gas~~ with said heated gas to the first desorption zone being heated to a higher temperature than the solids leaving ~~a~~ the first desorption zone or recycle liquid desorption zone, but significantly lower in temperature than that used for heated gas that enters ~~a~~ the final desorption zone ~~and~~ which removes the impurities from the solids as a concentrated impurity stream;

providing sufficient makeup gas to the first desorption zone to ensure gas phase and provide for the solution loss in the condensed liquid of the first desorption zone as well as some flow to the final desorption zone;

introducing said desorbed adsorbents solids from the final desorption zone into the cool-down zone of the regenerator;

introducing a reactivating gas effectively free from any agents that might interfere with the desired adsorption of impurities with makeup gas, sufficient to ensure gas phase, usually only a fraction of the gas entering, to accomplish cool-down of the adsorbent solids leaving the final desorption zone with cross flow contact using a plurality of countercurrent contacts to hot regenerated adsorbent leaving the final impurity stage downwardly flowing for the transfer of heat to the reactivating gas leaving the cool-down zone of the regeneration section;

causing said heated gas exiting from the said cool-down zone to enter a heater for heating to the required temperature to accomplish sufficiently ~~effectively~~ the desorption of impurities in the final desorption zone on a once through basis with neglible impurities entering in the gas to the said cool-down zone;

providing a regenerated adsorbent stream from said cool-down zone with cooling to remove the heat of wetting with a liquid before introducing into the adsorber section; and

recirculating the cooled regenerated adsorbent stream for introduction into the terminal adsorption stage of the ~~said~~ adsorption section.

2. (Currently Amended) The method of treating as set forth in claim 1, wherein 96 weight percent or greater of the particulate adsorbents are spherical and from ~~in an effective narrow range of~~ the 14 to 35 Tyler mesh range but with a particle diameter range of about 1.5.

3. (Canceled).

4. (Currently Amended) The method of treating as set forth in claim 1 ~~3~~, wherein any

excessive dienes in the recycled liquid condensate from the recycle desorption zone of the regenerator ~~regeneration section~~ are hydrogenated selectively with a nickel or palladium containing catalyst, or other catalyst, with limited hydrogen makeup, effectively moderate temperatures to avoid green oil formation or saturate olefins, and pressures below 300 psig before entering the adsorber. ~~adsorption section.~~

5. (Currently Amended) . The method of treating as set forth in claim 1, wherein the liquid feed stream is a liquid hydrocarbon feed ~~ranging fom 3 to 15 in carbon numbers~~ and the feed entering the adsorber adsorption section is not greater than 40 degrees centigrade.

6. (Currently Amended) The method of treating as set forth in claim 1, wherein the liquid stream is a liquid hydrocarbon feed ranging from 3 to 15 in carbon numbers with a hydrogen containing gas as the reactivating medium makeup and having the vapors leaving the final desorption zone to enter a vapor phase reactor for the hydrogenation of most of the entering heteroatoms with the resulting reactor effluent being condensed with cooling to enter a separator wherein the ~~hydrogenated~~ heteroatom concentrated liquid is ~~further~~ separated.

7. (Previously presented) The method of treating as set forth in claim 6, wherein the gas stream from the separator is treated for heteroatom removal and recycled as part of the reactivating gas to the cool-down zone of the regenerator.

8. (Canceled).

9. (Canceled)

10. (Original) The method of treating as set forth in claim 1, wherein the liquid stream is a hydrocarbon feed and the condensed liquid from the recycle liquid desorption zone is injected into the latter stages of the adsorption section.

11. (Currently Amended) The method of treating as set forth in claim 10, wherein the condensed liquid from the liquid recycle desorption zone is subjected to diene removal if excessive in dienes prior to being injected into the latter stages of the adsorption section.

12. (Currently Amended) The method of treating as set forth in claim 1, wherein the liquid stream is a hydrocarbon feed ~~ranging from 3 to 15 in carbon numbers~~ with the effluent vapors from the final desorption zone of the regeneration section being heat exchanged and cooled to produce a reduced volume of concentrated heteroatom liquid economically suited to ~~capable of~~

being biologically desulfurized. ~~or hydrogenated, or other treatment to remove the sulfur compounds.~~

13. (Canceled)

14. (Currently Amended) The method of treating as set forth in claim 1, wherein a limited amount of reactivating gas makeup is used with a hydrogen containing gas entering ~~is used~~ as gas makeup to the first desorption zone of the regenerator, while nitrogen or other gas enters ~~is used~~ as ~~the reactivating~~ gas makeup to the cool-down zone of the regenerator.

15. (Currently Amended) The method of treating as set forth in claim 1, wherein total reactivating gas makeup is about ~~less than~~ 5 percent of the gas entering the cool-down ~~final desorption~~ zone.

16. (Currently Amended) The method of treating as set forth in claim 1, wherein the adsorber section comprises a limited number of fluidized stages by limiting the bed expansion in the fluidized zones of the adsorption section, preferentially increasing in ascending order from ~~with~~ less than seven meters settled bed height in the fresh feed entry adsorption stage to ~~and~~ less than thirty meters settled bed height in the final adsorption stage.

17. (Currently Amended) The method of treating as set forth in claim 1, wherein the adsorption ~~adsorber~~ section comprises more than one adsorption vessel and the method comprises using part of the liquid adsorption stream from a preceding adsorption vessel closer to the fresh feed as a liquid lift for the withdrawn slurry from the succeeding vessel to reduce the pumping head required for the major part of the liquid adsorption stream that enters as feed to the succeeding vessel.

18. (Currently Amended) The method of treating as set forth in claim 1, wherein the method further comprises using an enlarged diameter section at the top of ~~the~~ an adsorber ~~section~~ to facilitate separation of the solids from the liquid while reducing the height for a given bed inventory in the ~~top~~ upper stages of an adsorption vessel for ~~and~~ permitting lift liquid to be used or liquid to be injected in the upper stages without any increase in superficial velocity for the liquid in the fluidized beds below the enlarged diameter section.

19. (Canceled)

20. (Currently Amended) The method of treating as set forth in claim 1, wherein the method comprises using screened, smaller diameter adsorbent solids discarded long term from the

regenerator as a filtering medium for the fresh feed to be treated to ensure removal of scale, poisons, and other debris ~~or non-regenerable poisons~~ from contaminating the circulating adsorbent used.

21. (Previously presented) The method of treating as set forth in claim 1, wherein the liquid stream is a hydrocarbon feed and the method comprises removing corrosive agents including mercaptans to a level below 0.5 ppmw for the adsorber treated product.

22. (Currently Amended) The method of treating as set forth in claim 1, wherein the liquid stream is a dirty, liquid ~~hydrocarbon~~ stream such as from a coker or visbreaker, and the method comprises producing a clear water-white product, free from any noxious odors as the adsorber treated product.

23. (Currently Amended) The method of treating as set forth in claim 1, wherein the liquid stream is a liquid hydrocarbon feed and the method comprises removing nitrogen compounds to less than 0.3 ppmw nitrogen in the adsorber treated product.

24. (Currently Amended) The method of treating as set forth in claim 1, comprising a step of gravity transfer between stages of the adsorption vessel using a device for interface fluid-solid level detection for the solids containing bed in a stage and control of the solids transfer by varying the opening using a valve in the conduit ~~using a valve~~ from the bed distributor of the upper stage that contains openings smaller than the fluidized particles which permit liquid effluent from the stage below to enter the succeeding stage.

25. (Previously presented) The method of treating as set forth in claim 24, wherein the slurry conduit enters about the normal expanded solids bed height of the succeeding lower stage.

26. (Original) The method of treating as set forth in claim 24, wherein the differential for transfer of solids is provided by slurry density in the conduit versus clear liquid density available below the upper stage distributor.

27. (Original) The method of treating as set forth in claim 26, wherein the slurry conduit is located outside the adsorption vessel so that external access to the transfer valve is facilitated and interference with even, smooth distribution of the liquid entering the distributor above is minimal.

28. (Currently Amended) The method of treating as set forth in claim 1, wherein gravity

transfers the solids in a continuous manner with a thin, cross-flow bed ~~less than~~ about 0.5 meter in thickness for gas cross-flow with baffling on the gas side and with controlled gas flow rates for gas cross-flow in the various desorption zones of the regenerator to minimize the residence of solid particles subject to temperatures that may cause carbonaceous deposits to form on the adsorbent while avoiding readsorption due to colder temperature of the particles at the gas outlet caused by increased bed flow lengths.

29. (Currently Amended) The method of treating as set forth in claim 1, wherein liquid feeds to the adsorber are cooled below ambient, particularly for low impurity adsorber treated product, such as below 5 ppmw sulfur, while treating a ~~any~~ catalytic cracker full boiling range gasoline, ~~or derived fractions, pyrolysis gasoline or other olefinic fresh feedstocks~~.

30. (Canceled)

31. (Canceled)